Next Generation Internet (NGI) Initiative

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Vision for NGI

Allow researchers to live in the future, developing and experiencing technologies and benefits of very advanced networking

Vision for NGI

- Long-range research to develop and test advanced network technology
- Test beds of sufficient scale for
  - Technology scaling issues
  - Critical mass for applications
- Important government-interest applications to
  - Test advanced network technology
  - Demonstrate value of advanced networks
- Partnerships to conduct research and to transfer technology for future commercial Internet

21st Century Applications

Network Uses	**Application Examples**	**Rqmts**
Teleoperation	Telemedicine, Distance Learning, Telescience	1 Gbps
Virtual Reality, Visualization	Battlefield awareness, Virtual Aerospace environment, Engineering	155 Mbps-1 Gbps
Collaboratories	Chesapeake Bay virtual environment, Materials collaboratory	155 Mbps/ link
Network Research	Intelligent Assistants, Optical Nets, Systems of systems	10 Gbps
Distributed Data and Digital Libraries	Genome Database, Patient records, Earth and Space science	1 Gbps
Computation	Aerodynamics, astrophysics, Global Change, Stockpile Stewardship	2.4 Gbps

Collaboratories

- Floor Control
- Security
- Collaboration Management
- Guaranteed QoS for control traffic
- Screen Real Estate scalability
- Protocols for info exchange
- Latency/variability

Remote Experimentation

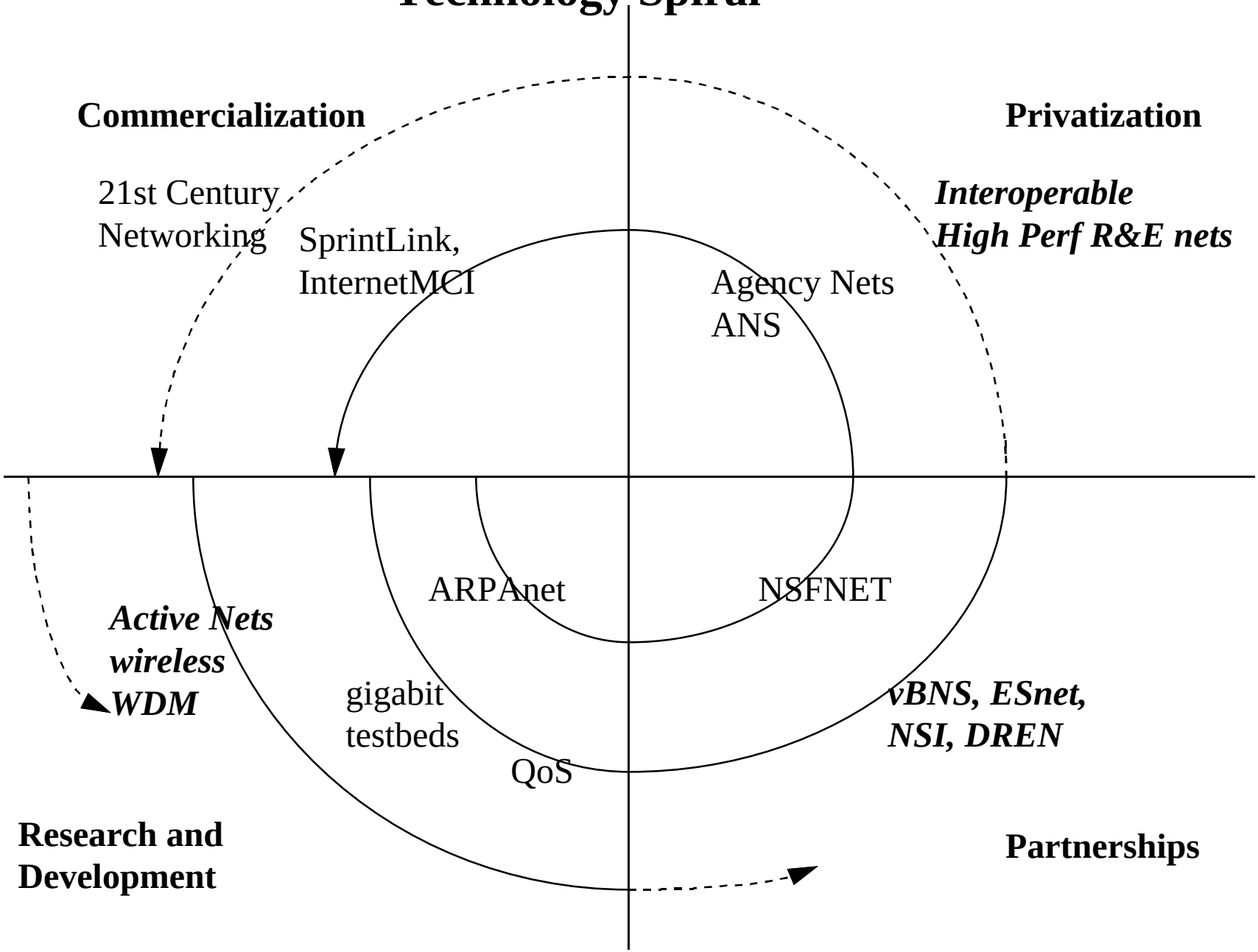
- Security
- Guaranteed QoS
- Needs Collaboratory Services
- Human Factors

Distributed Computing

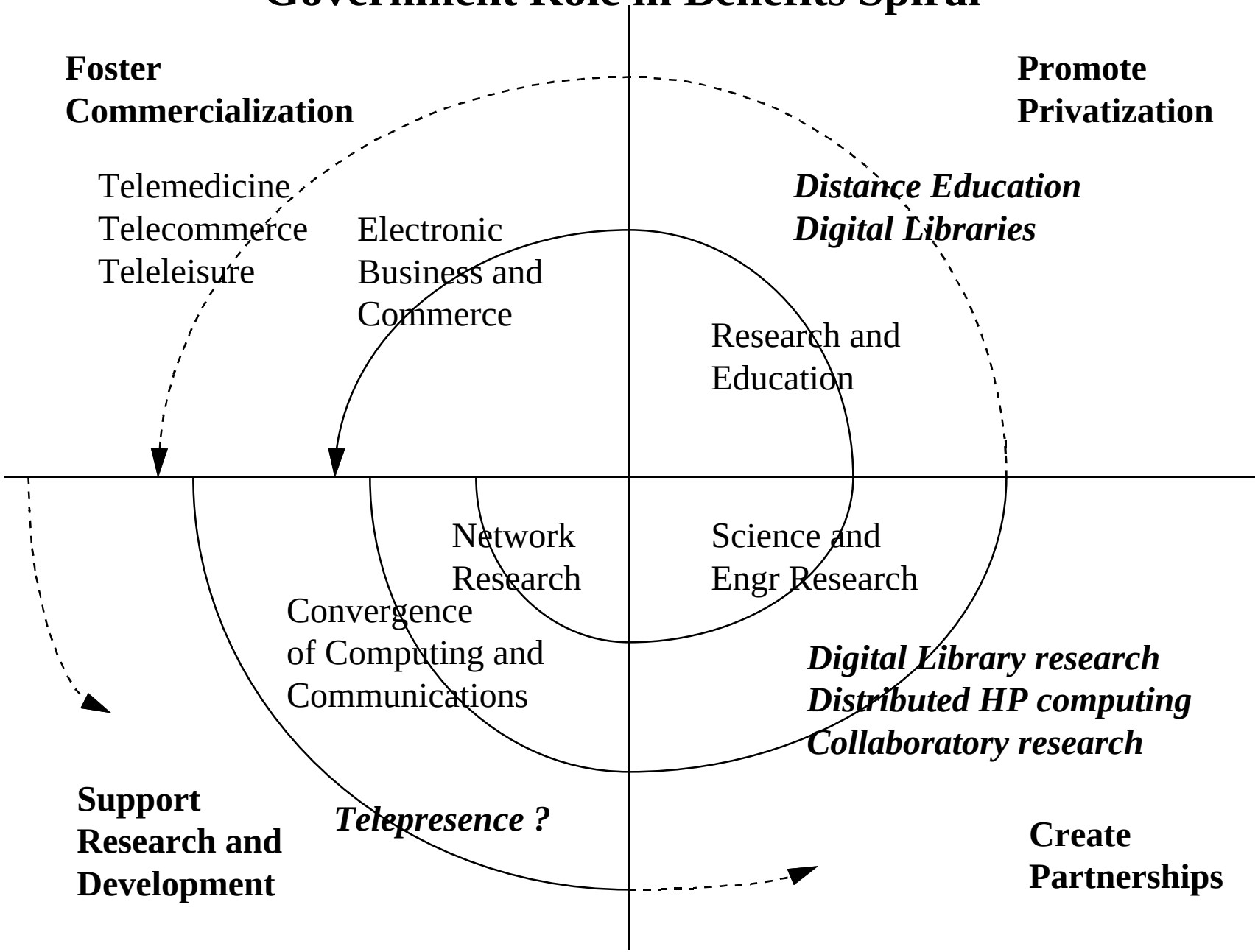
- Non Blocking Control and Data transport
- End-to-End performance including OS
- Interrupt Design (start work while data arriving or wait till all there)
- Multicast/Unicast
- Security
- Collaborative steering

Initiative Goals	Metrics
1. Connect research universities and federal research institutions with high-performance networks: **1.1 At least 100 organizations at speeds of 100 times today's Internet** **1.2 At least 10 organizations at speeds of 1000 times today's Internet**	**end-to-end performance; number of institutions connected**
2. Promote experimentation with the next generation of networking technologies.	**quality of service; adoption of technologies by commercial internet**
3. Demonstrate new applications that meet important national goals and missions	**100+ high importance applications; value of apps. in testing network technologies**

Technology Spiral



Government Role in Benefits Spiral



NGI FY98 Proposed $100 Million Budget
(Dollars in Millions)

	DARPA	NSF	DOE	NASA	NIST
Goal 1: Advanced Connectivity	20	7	25	3	
Goal 2: Technologies	20	2	6	2	2
Goal 3: Applications		1	4	5	3
Total:	40	10	35	10	5

Note: Future versions of this paper are expected to include funding from additional agencies who want to be part of the initiative, for example NIH has expressed interest in joining the NGI.

Agency Strengths for NGI

- DARPA: High end testbeds, general networking expertise, networking research
- DOE: Network management experience, networking research, mission applications
- NASA: Network management experience, mission applications
- NIST: Standards and networking research
- NSF: Network management experience, networking research, academic applications and relationships

Strategic Approach

- Build 100x network testbed over existing high-end networks
  - DREN (DoD), ESnet (DOE), NREN (NASA), vBNS (NSF)
- Build 1000x network over DARPA testbed
- Share responsibilities for networking research and technology, with work done in universities, labs, industry
- Devote 10% of NGI budget to attract applications

Initiative Deliverables	First Achieved
• 100+ site high-performance testbed providing OC-3 connections over OC-12 infrastructure	1999
• Federal-Academic-Industry partnerships conducting applications/networking research on this (100X) testbed	1999-2000
• 10+ site ultra-high performance testbed(s) providing OC-48 connections	1999-2000
• Consortium(s) conducting networking/applications research on this (1000X) testbed	2000-2001
• Tested models for next-generation internet protocols, management tools, Quality of service provisions, security, and advanced services	2000
• 100+ high value applications testing and benefiting from high-performance testbed	1999-2000
• 10+ advanced applications testing and benefiting from ultra-high performance testbed	2002

For More Information

www.ngi.gov